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Supracondylar Fracture Femur Treated With Intramedullary Nail – A Prospective Study of 20 Cases

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Abstract:
Background: *Supracondylar fractures are one of the commonest fractures encountered in high velocity trauma which are associated with high morbidity and mortality.Isolated fracture can itself lead to complications such as ARDS and pulmonary embolism.this necessitates early stabilization of fractures.Internal fixation is the choice of treatment in supracondylar fractures(AO type – A).Retrograde supracondylar nail has shown to give one of the best results in terms of recovery,fracture union, return to work and the functional outcome.*
Methods: *20 patients with supracondylar fracture femur were studied (AO type-A).Supracondylar fractures femur were treated by closed reduction and internal fixation by Retrograde supracondylar nail inserted through inter-condylar notch between July 2012 to September 2014 at our institution.The patients were evaluated clinically and radiologically for outcomes.All patients were followed up for an average of 12 months.Outcome was assessed using NEER'S SCORE.*
Results: *Supracondylar femoral extra-articular fractures in 20 patients were treated in this study with retrograde intramedullary supracondylar nail after closed or open reduction.The AO-ASIF fracture classification was used.All extra-articular fractures were selected for study.Six were compound fractures according to the Gustilo-Anderson classification, the fracture was stabilized with the chosen system at an average of 6.9 days post-trauma, with an average operative time of 65.9 minutes. In 15 cases closed reduction was possible while 5 required open reduction. Post-operatively all patients were shifted to continuous passive mobilization with early toe touch walking and gradually progressive weight bearing with appearance of clinical and radiological signs of union. Evaluation was done according to Neer's rating system. 65% excellent results were found. In the present study, road traffic accidents were observed to be the predominant cause of distal third femoral fractures in young patients. All fractures had a sound clinical and radiological union with an average radiological union time of 16.2 weeks and average full weight bearing time was 13.4 weeks. Average knee flexion was 118 degrees with an extensor lag of 4.15 degrees.*

I. Introduction

In the few decades, rapid industrialization and the fast pace of life have brought both comforts and catastrophe like road traffic accidents and crippling many young lives. Supracondylar and intercondylar femoral fractures are often difficult to treat and they are notorious for many complications.

In the early 1960s, there was a great reluctance towards operative management of this fracture because of high incidence of infection, non-union, malunion, inadequate fixation and lack of proper instruments, implant as well as antibiotics. Then, the traditional management of displaced fracture of supracondylar of femur was along the principle Watson Jones & John Charnely. This comprised of skeletal traction, manipulation of fracture and external immobilization in the form of casts and cast bracings. These methods however, met with problems like deformity, shortening, prolonged bed rest, knee stiffness, angulation, joint incongruity, malunion, quadriceps wasting, knee instability and post-traumatic osteoarthritis.

The trend of open reduction and internal fixation has become evident in the recent years with good results being obtained with the AO blade plate, dynamic condylar screw and other implant systems like intramedullary supracondylar nails.

Supracondylar fractures tend to collapse into varus, due to strong adductors. During application of AO blade plate or dynamic condylar screw, the shaft of femur is often pulled laterally displacing the line of weight bearing, lateral to the anatomic axis of condyle. This creates rotational movements at the fracture site that causes pulling off the blade plate or condylar screws leading to fatigue fracture of the plates. Also, the presence of osteoporotic bone leads to fixation failures with screws and plates cutting the soft bone.

In addition, a retrograde intramedullary supracondylar nail has got distinct advantages of preservation of fracture hematoma, decreased blood loss, minimal soft tissue dissection, less operative time and reduced rate of infection.

The purpose of this study is to evaluate the results of supracondylar and intercondylar fracture of femur, treated by close/open reduction and internal fixation using retrograde intramedullary supracondylar nail.

II. Materials & Methods

In this study 20 patients with supracondylar fracture of femur without intercondylar extension were studied. All the cases treated in Government General Hospital, Vijayawada attached to Siddhartha Medical College between the period of July 2012 to September 2014. The method used for fracture fixation was closed or open reduction and internal fixation with retrogarade intramedullary supracondylar nail. The duration of follow up ranged from 4 months to 24 months.

All the fracturesin this series were post-traumatic. No pathological fracture was included in the study. Also supracondylar fractures in children were not considered. The study was restricted to fractures occurring at the region 9 cm proximal to lower end of the femur. Supracondylar fractures treated conservatively and fixed with other fixation systems like dynamic condylar screw, AO blade plate and condylar buttress plate are not included.

The following protocol was observed for patients with supracondylar fractures of femur on arrival.

1. General and systemic examination as well as local examination of the patient.
2. Thorough assessment of patient to rule out head/chest/abdominal/spinal or pelvic injury.
3. Evaluation of patient in terms of : age, sex, mode of trauma, period between injury and arrival.

- Musculo-skeletal examination of patient to rule out associated fractures.
- Stabilization of patient in terms of Airway, breathing and circulation by oxygen, transfusion of crystalloids and colloids as and when required.
- Careful assessment of injured limb as regards to neurovascular status.
- Primary immobilization of involved limb in Thomas splint.
- Radiological assessment: Anteroposterior and true lateral views of injured limb including complete knee joint and distal femur.
- Upper tibial skeletal pin traction with a Steinmann drilled under local anaesthesia followed by continuous traction given over Bohler-Braun splint.
- Compound injuries were taken for cleaning and debridement under anaesthesia at the earliest with meticulous debridement. Fixation was delayed in all cases.
- Injection ATS 1500 IU, Injection AGGS 30,000 IU, broad spectrum injectable antibiotics and analgesics were administered for compound injuries as and when required.
- Patient Selection:
- Patients attended to Government General Hospital, Vijayawada with supracondylar fractures of femur with:

Inclusion Criteria :-

1. Type-A fractures (AO classification)
2. Grade 1, 2 and 3A fractures (Gustilo-Anderson classification)
3. Medically fit patients
4. Patients of both sex
5. Patients in the age group of 18-75 years

Exclusion Criteria :-

1. Patients with type B and C fractures (AO classification)
2. Grade 3B fractures (Gustilio-Anderson classification)
3. Medically unfit patients
4. Patients below 18 years and above 75 years
5. Patients with pathological distal femoral fractures other than osteoporosis
6. Patients lost in follow-up
7. Distal femoral fractures with neurovascular compromise

Implant Used :-

- The implant used was supracondylar nail system with instrumentation set.
- The nails are available with outer diameter of 10, 11 and 12 mm
- The distal end is expanded to outer diameter of 13 mm
- The nails are available in lengths of 150, 200 and 250 mm.
- There is 5 degree anterior bend and anterior bow for anatomic fit.

All sized nails have five interlocking holes in all lengths two proximal holes and three distal holes, which accept interlocking screws of 4.9 mm thread diameter. The interlocking holes are medio-laterally directed.

III. Results

In this study 20 patients with supracondylar fracture of femur without intercondylar extension were studied. All the cases were treated in Government General Hospital attached to Siddartha Medical College Vijayawada between July 2012 to September 2014. The method used for fracture fixation was closed or open reduction and internal fixationwith retrograde intramedullary supracondylar nail. The duration of followup ranged from 4 months to 12 months. 85% good to excellent result were obtained using Neer's evaluation scoring system. In this study, the youngest case was 30 years old male and the oldest was 75 years. Overall mean age was 52.15 years. In males, it was 44.89 years and females it was 47.5 years. In this study left side affection was seen more than right side. 75% freactures were sustained due to road traffic accidents. 15% were fall from height. 2% was accidental fall. In the present study, there were 6 compound fractures, 4 being grade-II and 1 being grade-III according to Gustilo-Anderson's classification. Average Operative time was 86.5 minutes. It is 82.3 minutes for type A1, 93 minutes for type A2 and 130 minutes for type A3 fractures. In majority of the fracture type of A1 and A2 were closed reduction was possible, while in A3 subtype, cases required open reduction. Maximum closed reduced fractures required less than or 90 minutes for operation. While maximum open reduction fractures required more than 90 minutes operative time. Average operative time for closed recuced fractures was 79.3 minutes. Average operative time for open reduced fractures was 108 minutes. 12 out of 15 cases done within 7 days were reduced closely. Where as 4 out 5 cases done after 7 days needed open reduction. Average radiological union time was 17.3 weeks. Average flexion attained in this study was 93.25 degrees. More than 110 degrees flexion range was observed in 50% of the cases. Average extensor lag in this study was 5.75 degrees. Out of 20 patients, one had shortening of 23 mm. Local symptoms at distal screws was found to be the commonest complications like pain and loosening of screws. Long-term results were rated using the Neer's rating system, which allots points for pain, function, working ability, joint movements, gross and radiological appearance. In 65% cases, there was good to excellent results. No statistically significant correlation was found between knee flexion and age. One case with 75 degree flexion in A1 type of supracondylar fracture had comminuted proximal tibial fracture, which delayed the mobilization and weight bearing. Seven of Ten cases with A2 type had >110 degree flexion(70%). 4 of 9 cases with A1 type had >110 degree flexion(44.5%). One case of A3 fracture had <90 degree flexion. 46.6% patients with closed reduction had >110 degree flexion while 80% patients with open reduction had >110 degree flexion. Final knee flexion was better, the earlier the patient was operated. Average weight bearing for A1 type fractures was 8.84 weeks, Type A2 was 10.53 weeks and 8 weeks for type A3 fractures. 70% of cases done by closed method and 90% done by open method had full weight bearing within 8 to 12 weeks. Average weight bearing for closed reduction was 12.2 weeks, and for open reduction was 13 weeks.

IV. Discussion

Mean age group reported in this study was 52.15 years. Our study coincides with those of GellmanRet al. In the present study, there were 15 male patients with average age group 48.5 yrs, and 5 female with average age of 63 years. Thus, in the study conducted by Gellman (1996) and Watanabe (2002), where female predominance was seen. The age group under consideration was older in contrast to the study by Lucas SE (1993) and the present study, where male predominance was observed. Studies conducted by Schatzker et al (1974), Yang RS et al (1990) and Leung KS et al (1991), demonstrated road traffic accidents as major causal factor. In the present study, RTA accounted for 75% of cases and 15% resulting from fall from height and another 10% accounted for accidental fall. We also agree with the results of Gellmann Re (1996) eho stated that high energy fractures occurred more in young, male patients and low energy falls caused fractures in older age group.

High percentage of compound injuries were found in the studies by Lucas SE et al (1993), Iannacone et al (1994). In the present study, there was 6 compound fractures, one being grade I and 4 being grade II and one grade III according to Gustilo-Anderson classification. Of the 6 cases, 4 cases were male and 2 were female. Among them 5 were due to RTA and one by accidental fall. Patients with Gustilo-Anderson grade II and III were operated as early as possible. The final outcome in terms of knee flexion was not affected by nature of fractures. 3 out of 6 compound injured had knee flexion of >118 degree (50%), while 7 out of 14 closed fractures had knee flexion >118 degree (55%). Extensor lag was found to be more in compound fracture with 13 out of 6 patients having extensor lag >10 degree as compared to 4 out of 13 for closed fractures.

In the present study, 6 patients had associated injuries. Of the 6 injured patients, 2 with ipsilateral proximal tibial fracture had knee flexion of average 82.5 degrees and extensor lag of >10 degree. Patient with patellar fracture had knee flexion of 110 degrees and no extensor lag. 2 patients with tibial spine fracture had average knee flexion of 110 degree and extensor lag of 9 degree. Thus, it appears that though significantly less number of patients in the present study had associated trauma, it seems to affect the final outcome. This can be attributed to delayed mobilization and delayed weight bearing in these patients. In the present study, the injury-surgery interval was 6.9 days. The interval between injury and surgery could be attributed to

- Days lost by the patient in transit from periphery to the institution, which caters to the tertiary care needs.
- Medical fitness of the patient for necessary anaesthesia.
- Arrangement for funds consumed considerable time.

The injury-surgery interval and final knee flexion were found to be inversely proportional with 61.5% of fractures fixed within 7 days (13 cases) had >110 degree flexion as compared to 42.95% after 7 days (7 cases). This leading relationship could be explained on the fact that surgery interval affected the type of reduction with 13 out of 17 fractures operated within 7 days could be closed reduced. And closed reduction was directly proportional to final knee flexion.

Average operative time in this study was 65.9 minutes. Majority of type A1 and A2 fractures required operative time >90 minutes and type A3 fractures required more than 90 minutes. Average radiological union in this study was 17.3 weeks. The patients which required more time for union were having some associated injuries which delayed the period of mobilization and partial weight bearing. In the present study, average knee flexion was 118 degree, which coincides with the previous other studies. Average extensor lag in this study was 5.4 degree.In the present study, we had 2 cases of superficial infection, treated by antibiotics and debridement. 3 cases of distal screw related problems were treated by screw removal. One case of delayed union was treated by delaying full weight bearing. Anterior knee pain due to impingement might be attributed to faulty nailing technique. Improvement in the nailing technique can reduce the incidence of impingement.

V. Conclusions

1. Retrograde intramedullary supracondylar nail is a good fixation system for distal third femoral fractures, particularly extra-articular type.
2. The operative time is lessened with decrease in blood loss, if closed reduction can be achieved by not disturbing fracture hematoma and soft tissue.
3. Even with open reduction, there is less soft tissue trauma and less post-operative stiffness.
4. Distal screw related local symptoms is acommon problem and is related to implant technique; and has a definite learning curve.
5. Utmost great care require to avoid infection.
6. There is no non-union, less delayed unions and rates of angular or rotational malunions.
7. Non-requirement of bone graft decreases the morbidity associated with donor site.
8. Early surgery, closed reduction, at least 2 screws in each fragment and early post-operative knee mobilization are essential for good union and good knee range of motion, weight bearing and early return to work.
9. Thus, supracondylar nail is the optimal tool for many supracondylar fractures of femur. It provides rigid fixation in a region of femur, where a widening canal, thin cortices and frequently poor bone stock make fixation difficult. Surgical exposure for nail placement requires significantly less periosteal stripping and soft issue dissection than that of lateral fixation devices. Orthopaedic surgeons experienced with intramedullary nail will find the supracondylar nail a useful technique, but requires attention to prevent complications.

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